

## **3.3 Fault Management Activities**

### **3.3.1 Production Failure Scenario**

#### **3.3.1.1 Scenario Description**

This scenario describes the activities involved in the detection, notification, isolation, and diagnosis of a hardware error in one of the CPUs associated with the primary/critical production system host. The error is detected by the management agent resident on the host, recognized as a critical error, and immediately forwarded to the management server in the form of an event notification. At the management server, the fault management application (HP OpenView) receives the notification and alerts the resource manager via a pop-up window and audible alarm. HP OpenView also sends a message to the production monitor and user services informing them of the fact that there is a hardware failure that will affect production. The resource manager acknowledges the alert and creates a trouble ticket assigned to the Local Maintenance Coordinator (LMC). The LMC receives the trouble ticket, verifies the cause of the problem, and contacts the vendor for maintenance support. The vendor schedules the required maintenance activities based on information coordinated with the resource manager and production monitor. The vendor arrives at the scheduled time, waits until the remaining production jobs are finished, and then performs a CPU board swap. Once the repair is completed, the system is rebooted and resumes normal production. HP OpenView detects that the host has returned to its normal operational state, changes the host's icon color accordingly, and sends a message to the production monitor and user services stating that production is back to normal. The LMC then closes the trouble ticket associated with the hardware failure.

The ECS personnel involved are the resource manager, user services, local maintenance coordinator, and production monitor.

#### **3.3.1.2 Frequency**

This scenario (or one similar to it) will run whenever an ECS host hardware failure occurs. This is a random event that will occur infrequently. Based on vendor - provided data, the estimated MTBF for hardware failures is 192 hours, which translates to approximately once per month for 8-hour shift operations and twice per month for 16-hour shift operations.

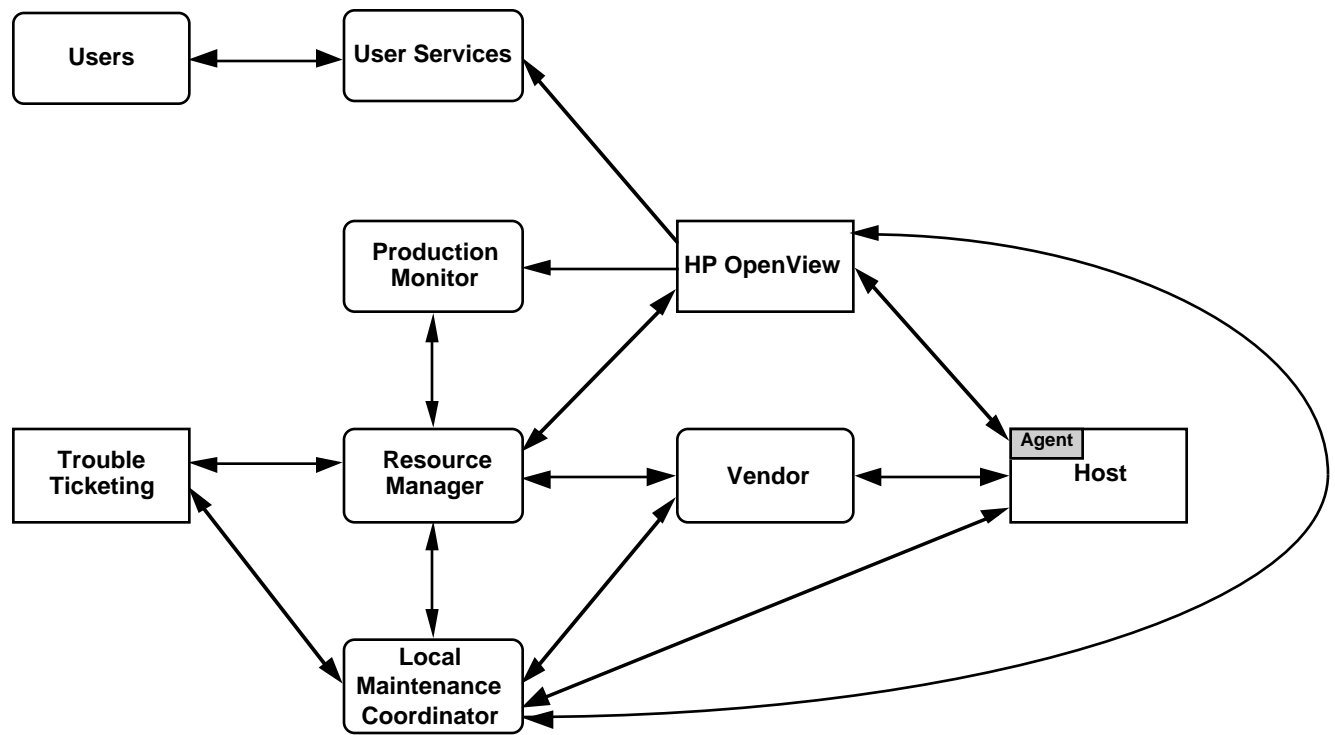
#### **3.3.1.3 Assumptions**

This scenario is based on the following assumptions:

1. The management agent has been configured to detect the hardware failure and send an event notification to the management framework (HP OpenView) immediately.
2. HP OpenView has been configured to notify the resource manager upon receipt of the event notification.
3. A maintenance contract has been established with the host vendor to respond for corrective maintenance within a specified time frame (4 hours).

### 3.3.1.4 Components

Figure 3.3.1.4-1 indicates the interaction between the DAAC personnel and the ECS subsystems.



**Figure 3.3.1.4-1. Production Failure Scenario Components**

### 3.3.1.5 Preconditions

One of the CPUs in an SMP (Symmetric Multiprocessing) host (the primary/critical production system) has experienced a hardware error.

### 3.3.1.6 Detailed Steps of Process

Table 3.3.1.6 represents the details of this scenario. The times and duration given are approximate.

**Table 3.3.1.6-1. Production Failure Scenario Process (1 of 10)**

<b>Step</b>	<b>Dur./ Start Time (Mins.)</b>	<b>User Services/ Production Monitor</b>	<b>Resource Manager</b>	<b>Local Maintenance Coordinator (LMC)</b>	<b>System</b>	<b>Vendor</b>
1	<1 Time = 10:00				The production host agent detects the hardware error and sends an event notification to HP OpenView, which is running on the management server.	
2	<1 Time = 10:01				<p>HP OpenView receives the management trap and performs the following actions which had been preconfigured for this specific trap:</p> <ol style="list-style-type: none"> <li>1. Changes the color of the host to yellow to indicate a degraded condition.</li> <li>2. Sends a message to the resource manager console via a pop-up window and audible alarm to indicate the nature of the problem.</li> <li>3. Sends a message to the production monitor and user services indicating that the production subsystem is operating in degraded mode.</li> </ol>	

Step	Dur./ Start Time (Mins.)	User Services/ Production Monitor	Resource Manager	Local Maintenance Coordinator (LMC)	System	Vendor
3	15 Time = 10:02		The resource manager receives the message in the pop-up window (Figure 3.3.1.6-1). Since the message indicates a hardware failure, the resource manager opens a trouble ticket, fills in the required fields, and submits the trouble ticket to the Operations Supervisor, who assigns the it to the local maintenance coordinator (LMC) (see trouble ticket screens in Section 3.2).		The trouble ticketing application opens and provides the resource manager with a blank trouble ticket form.	
4	<1 Time = 10:02	The production monitor and user services receive notification of the failure and note the potential impact to production and users, respectively, for future reference.				

Step	Dur./ Start Time (Mins.)	User Services/ Production Monitor	Resource Manager	Local Maintenance Coordinator (LMC)	System	Vendor
5	<1 Time = 10:17				The trouble ticketing application receives the trouble ticket submitted by the resource manager and adds it to the trouble ticket database. The application then sends an e-mail to the LMC indicating the newly-assigned trouble ticket.	
6	10 Time = 10:18			The LMC receives the notification of a newly assigned trouble ticket and opens the trouble ticket application. The LMC opens the new trouble ticket, identifies the reported problem, and checks the host (using vendor-provided host-based diagnostics) to verify the problem.	Vendor-provided host-based diagnostics on the production host are used by the LMC to isolate and verify the cause of the problem.	

Step	Dur./ Start Time (Mins.)	User Services/ Production Monitor	Resource Manager	Local Maintenance Coordinator (LMC)	System	Vendor
7	5 Time = 10:23			Having verified the source of the problem, the LMC updates the trouble ticket and calls the vendor to report the problem.	The trouble ticketing application updates the trouble ticket log with the LMC's notes, name, and the time of the entry.	The vendor receives the call from the LMC and opens a service ticket. The vendor verifies that a replacement circuit board is in stock and that he can arrange a service call within an hour. The vendor gives the LMC the assigned service ticket number and an estimate of thirty minutes downtime for the repairs.
8	1 Time = 10:28			The LMC updates the trouble ticket to include the vendor-assigned service ticket number.	The trouble ticketing application updates the trouble ticket record with the vendor service ticket number (along with the LMC's name and the time of entry).	

Step	Dur./ Start Time (Mins.)	User Services/ Production Monitor	Resource Manager	Local Maintenance Coordinator (LMC)	System	Vendor
9	15 Time = 10:29	The production monitor analyzes the production plan and the status of the day's jobs, which indicate that several long processes are about four hours from completion. The production monitor then recommends that the service call be arranged to occur following the completion of those processes. In determining the impact of the maintenance action on production, the production monitor will use a screen similar to that shown in Figure 3.12.2.6-1.	The resource manager talks to the production monitor about the availability of the host for a service call.	The LMC coordinates with the resource manager to determine an acceptable time for the service call.		
10	2 Time = 10:44		The resource manager informs the LMC that the service call should be arranged to occur in four hours.	The LMC coordinates the scheduled time with the vendor and updates the trouble ticket log to indicate this information.		The vendor receives the proposed service time with the LMC and agrees to arrive at the DAAC in four hours.
11	220 Time = 10:46				The production processes continue to run on the degraded host.	

Step	Dur./ Start Time (Mins.)	User Services/ Production Monitor	Resource Manager	Local Maintenance Coordinator (LMC)	System	Vendor
12	<1 Time = 12:30	A user services operator receives a call from a user reporting that an expected product has not been received yet. The user services operator recalls the earlier message warning of a problem with the production host and its potential impact on users. The operator opens the e-mail message log to review the original message and identify the host, (a search could be performed on received e-mail messages if required).			The e-mail log displays past messages sent to the user services operator.	
13	<1 Time = 12:31	The user services operator generates a list of open trouble tickets. The operator then identifies an open trouble ticket on the production host. The operator also scans the list for other trouble tickets that could also affect production using a Remedy key word search, but finds none.			The trouble ticketing application displays a list of open trouble tickets.	



Step	Dur./ Start Time (Mins.)	User Services/ Production Monitor	Resource Manager	Local Maintenance Coordinator (LMC)	System	Vendor
14	<1 Time = 12:32	The user services operator opens the trouble ticket, reviews the trouble ticket log, and reads that vendor maintenance on the host is scheduled for 2:30 that afternoon. The operator then informs the caller that the system is running in degraded mode, but should be back to normal in several hours.			The trouble ticketing application displays the selected trouble ticket.	
15	1 Time = 14:26					The vendor arrives on-site with a replacement circuit board and informs the resource manager that he is prepared to perform the repairs.

16	3 Time = 14:27	The production monitor indicates that the production jobs should finish shortly.	The resource manager looks at the host on HP OpenView and notices that several processes are still running. The resource manager coordinates with the production monitor.			
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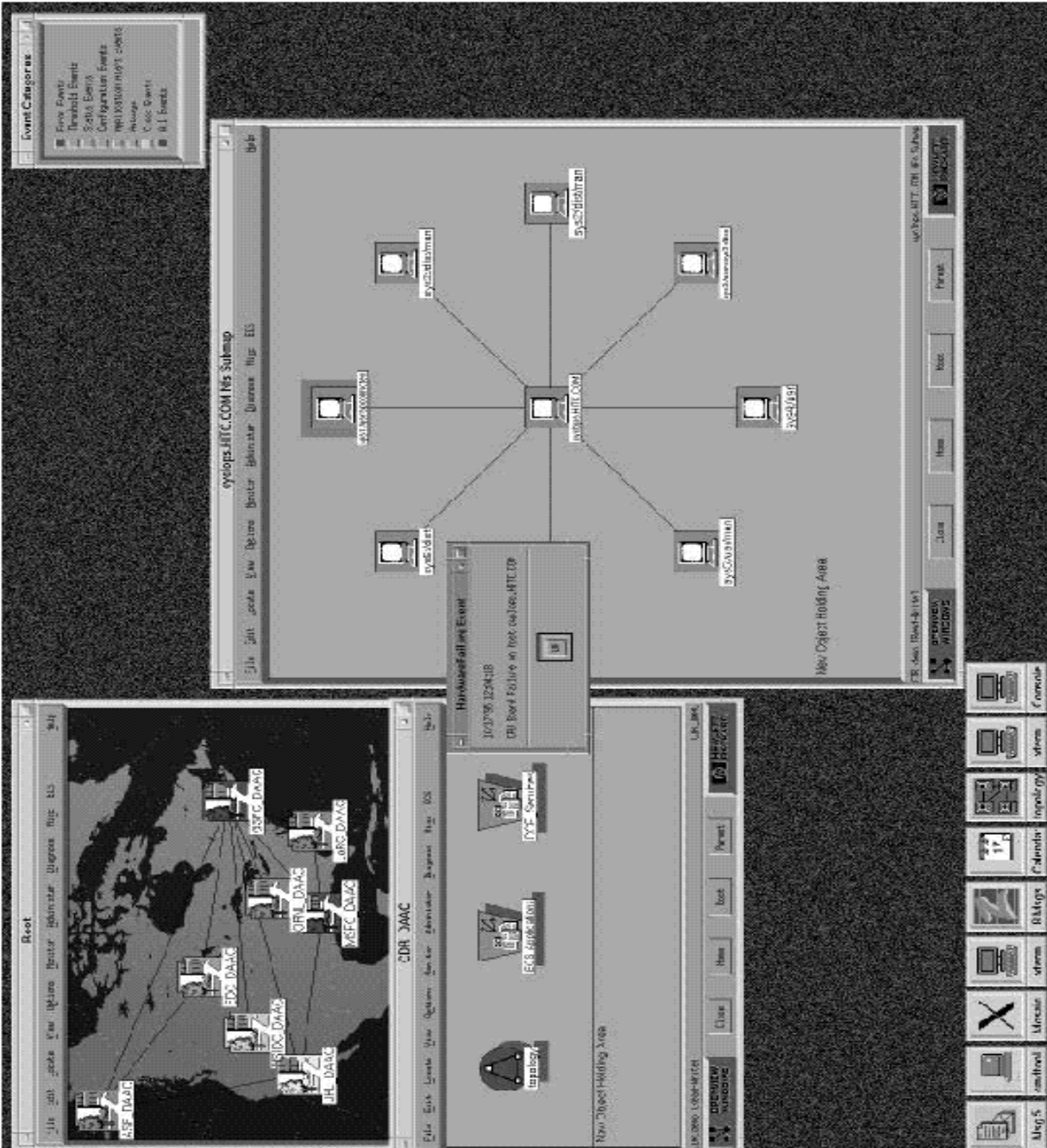
Step	Dur./ Start Time (Mins.)	User Services/ Production Monitor	Resource Manager	Local Maintenance Coordinator (LMC)	System	Vendor
17	10 Time = 14:30	Once the production jobs are completed, the production monitor informs the resource manager that the system is ready for the maintenance activity.	The resource manager waits for the production jobs to complete.			
18	2 Time = 14:40		The resource manager shuts down remaining applications that are running on the production host and gives the vendor permission to begin the maintenance activity.			
19	30 Time = 14:42					The vendor replaces the failed CPU board and runs diagnostics on the replacement board to verify that the host is running correctly.

Step	Dur./ Start Time (Mins.)	User Services/ Production Monitor	Resource Manager	Local Maintenance Coordinator (LMC)	System	Vendor
20	5 Time = 15:12		The resource manager reboots the machine with the normally running production applications.			
21	3 Time = 15:17			The LMC updates the trouble ticket status to closed and indicates the maintenance activities performed in the resolution log of the trouble ticket form.	The system updates the trouble ticket record with the new status and resolution log entries. The trouble ticketing application sends an e-mail message to the resource manager indicating that the status has been changed to "closed."	
22	<1 Time = 15:20				HP OpenView detects that the status of the host has returned to normal and performs the following preconfigured activities: 1. Changes the color of the host to green to indicate the normal condition. 2. Sends a message to the resource manager console via an entry in the event log to indicate the change to a normal condition.	

Step	Dur./ Start Time (Mins.)	User Services/ Production Monitor	Resource Manager	Local Maintenance Coordinator (LMC)	System	Vendor
					3. Sends a message to the production monitor and user services indicating that the production subsystem is operating normally again.	
23	<1 Time = 15:20	Production monitor and user service receive notification of the production host returning to normal operation.	Resource manager notes the color of the production host icon return to green to indicate a return to normal operations.			

### 3.3.1.7 Postconditions

The production host is repaired and running at full capacity.



**Figure 3.3.1.6-1. HP OpenView Hardware Failure Screen**